Remarks/Arguments

Claims 1-202 are pending in the subject application. Claims 1-100 and 200-202 are cancelled herein. The claims have been amended to more particularly define the invention. Independent claims 101 and 159 have been amended to incorporate subject matter from claims 103, 109, 112 and 113, and the description. It is believed that this new claim is fully supported by the description as filed and that no new matter is being added to the application through this amendment.

I. Information Disclosure Statement

Applicants have provided herewith copies of the documents cited in the Search Report, together with an Information Disclosure Statement. Consideration of the cited documents is respectfully requested.

II. Rejection of Claims Under 35 U.S.C. § 102(b) over Ribi et al.

Claims 101-200 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Ribi et al. The Examiner asserts that Ribi et al. discloses each of the elements of the claimed invention.

This rejection is respectfully traversed as follows.

In one aspect of the invention, the invention is directed to a method for indicating an end of life of a respirator cartridge, an air purifying cartridge or a filtration cartridge, through the detection of a chemical substance in an analyte. In accordance with this method, an optically anisotropic material forming a porous fiber or slab is provided in a sorbent bed of the cartridge, which is subjected to the analyte. Visible light is passed through the anisotropic material by transillumination, that is, by illuminating the object by passing light through its generally opposing walls (as defined at page 11, lines 14 to 18 of the description). The passed light is collected, and a change in its polarization state is detected. This change is indicative of the analyte having reached the anisotropic material through an absorbent bed, and therefore indicates that the cartridge has reached the end of its useful life. In another aspect of the invention, there is described and claimed a sensor for indicating an end of life of a respirator cartridge.

It is respectfully submitted that the claimed invention is new and non-obvious over the cited prior art.

RIBI et al. teaches an apparatus and methods for the detection of analytes. It uses an anisotropic material which is a polyunsaturated polymerized lipid layer having a member of a specific binding pair bound to an end of the lipids, and whose optical characteristics are modified upon complex formation between the specific binding pair member and its complementary member. The change in these optical characteristics can be detected by passing light through the material and observing variations in its polarization.

RIBI fails to teach several of the elements of claims 101 and 159 as amended herein. Firstly, the scheme of RIBI is not destined to be used for indicating an end of life of a respirator cartridge, an air purifying cartridge or a filtration cartridge, and as a matter of fact, could not be used for this purpose. Indeed, the sensor of RIBI is, by design, specific to a selected chemical: a broadband chemicals detection would be necessary for being a good end-of-service-life indicator as various chemicals may pass trough the cartridge. It would be also very difficult to miniaturize the device of RIBI (especially if multiple chemicals need to be detected) so that it does not disturb the flow into the cartridge while being in close contact with the sorbent bed to insure accurate detection. Additionally, the anisotropic material of RIBI is of a crystalline nature, which could not be "porous" by any understanding of the term. It therefore cannot be said that RIBI contemplates providing an optically anisotropic material forming a porous fiber or slab in a sorbent bed of the respirator cartridge, air purifying cartridge or filtration cartridge.

This difference in the nature of the anisotropic material implies a fundamental difference in the detection schemes of RIBI and of claim 101 of the present application, as completely different phenomena are involved. Central to RIBI is the presence of a monolayer comprising lipids polymerized through triple bonds to form an extended polyunsaturated chain (see RIBI, col 3, lines 14 to 18). By contrast, a porous material, as the material used in the present invention, can be used to detect the presence of an analyte through a change in the optical birefringence or dichroism of the anisotropic material in the presence of the chemical substance due to swelling of the anisotropic material or due to the condensation of this substance into the porous anisotropic material. Clearly, one skilled in the art would not have been led to the use of such a phenomenon from a reading of RIBI.

Additionally, as RIBI does not mention a cartridge having a sorbent bed, it cannot be said to teach of detecting a change in the polarization state of collected visible light which is indicative of a chemical substance in an analyte having reached the anisotropic material through a sorbent bed.

Although end of service indicators including a porous waveguide for use in a respirator cartridge or the like are known from prior art, such devices do not usually involve transilluminating the porous optical fiber with optical light. Optical fiber devices generally use the guiding property of light by total internal reflection, which implies coupling light within the porous optical fiber at an input end, and collecting the light exiting at the opposite end of the optical fiber, for analysis. As one skilled in the art will readily understand, transilluminating an optical fiber does not use the guiding properties of the fiber, but simply shines light on the side walls of the fiber so as to observe the light transmitted therethrough.

None of the prior art documents known to the inventors would lead one skilled in the art to make an end of life indicator by combining the transillumination of a porous optical fiber or slab and the observation of a change in polarization of the passed light induced by the properties of porous materials. Although the birefringent nature of microporous glasses are known *per se*, nowhere, to the inventor's knowledge, was the use of such glasses for an end of life indicating sensor suggested. The combinations of independent claims 101 or 159 present several advantages over the teachings of known end of life indicators. Firstly, passing the visible light through the anisotropic material by transillumination enables the use of a shorter porous fiber than devices using the guiding properties of optical fibers, where it is necessary to guide the light over a sufficient length for the intensity of the light to be affected in a significant, detectable manner. The use of a shorter length of fiber in turn greatly simplifies the manufacturing of a device according to the invention, since porous fiber can be fragile and delicate, which complicates its embedding in a sorbent bed of a cartridge. Additionally, transillumination eliminates the need for the precise coupling of the porous optical fiber with input and/or output fibers to minimize losses at the fiber-fiber interface. The use of the change in the polarization state of the collected light as a scheme of detection enables the transillumination of the porous fibers since it does not rely on a precise monitoring of light intensity. Instead, several approaches can be used to analyze the collected visible light, all of which generally rely on phenomena that is easier to detect. In one example, a simple color shift in the collected light can be observed

when the chemical substance is absorbed by the porous optical fiber, in which case simple visual observation can be used as a light collecting scheme. In other examples, a change in the ratio of the intensities of two orthogonal polarization states or in the ratio of the intensities of two different wavelengths of the collected light can be measured. Each of these approaches is advantageously less sensitive to variations in the intensity of the light source when compared to the detection scheme of other end of light indicating technologies.

In view of the above, claims 101 and 159 as they now stand are considered new and non-obvious over the cited and submitted prior art. As all other claims are ultimately dependent on either claim 101 or 159, they are considered patentable on the same grounds

Accordingly, it is respectfully submitted that the rejection of claims 101-200 under 35 U.S.C. § 102(b) over Ribi et al. is respectfully traversed.

It is respectfully submitted that the present application, with amended claims 101-200, is in condition for allowance, an early notification thereof being earnestly solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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